PATENT ABSTRACTS OF JAPAN

(11)Publication number : 09-170181

(43)Date of publication of application : 30.06.1997

(51)Int.Cl. D06P 5/00
B41J 2/525
B41J 2/21
C09D 11/02

(21)Application number : 07-349805

(22)Date of filing : 20.12.1995

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(54) FORMATION OF COLOR IMAGE

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a color image excellent in color reproductivity, high in image quality and resolution by using a yellow, a magenta and a cyanic aqueous recording inks having color concentration values and maximum absorption wavelengths adjusted to specific ranges by an ink-jet method.

SOLUTION: In an aqueous recording ink for forming a color image on a material to be recorded by using at least three colors of yellow, magenta and cyanic color by an ink-jet method, color concentration values (values measured at 0.5g/l by a phosphoric acid buffer solution) are adjusted to 20-85 in the yellow, to 35-115 in the magenta and to 40-115 in the cyanic color by blending two or more dyes, respectively. The maximum absorption wavelengths in a visible light ranges (values measured at pH7 by a phosphoric acid buffer solution) are adjusted to 350-450nm in the yellow, 500-600nm in the magenta and 600-680nm in the cyanic color to give the objective aqueous recording ink excellent in balance of hue and concentration of each color.

LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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CLAIMS

[Claim(s)]
[Claim 1] The color picture formation approach characterized by the aquosity record ink composed from yellow, the Magenta, and the color of cyanogen each hue fulfilling the following conditions in the approach of forming a color picture in a recorded material by the ink jet recording method using three colors of yellow, a Magenta, and cyanogen at least.
Yellow: (it is the same the value measured by the 0.5 g/L;pH7 phosphoric-acid buffer, and the following) The depth-of-shade value (Avis) calculated by the Garland type should be in the range of 20 to 85.
Magenta: The depth-of-shade value calculated by the Garland type (Avis) Be in the range of 35 to 115.
Cyanine: The depth-of-shade value calculated by the Garland type (Avis) Be in the range of 40 to 115.
[Claim 2] The color picture formation approach according to claim 1 characterized by the maximum absorption wavelength (it being the same the value measured by the pH7 phosphoric-acid buffer and the following) of the visible region of yellow, a Magenta, and the aquosity record ink of each hue of cyanogen being in the following range.
yellow: -- 350nm - 450nm Magenta: -- 500nm - 600nm cyanine: -- 600nm - 680nm -- [Claim 3] Yellow, a Magenta, and each hue aquosity record ink of cyanogen use two or more sorts of colors, and it is a depth-of-shade value (Avis). The color picture formation approach characterized by adjusting and becoming so that it may become the predetermined range.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the approach of forming a color picture in a recorded material by the ink jet recording method using three colors of yellow, a Magenta, and cyanogen at least.
[0002]
[Description of the Prior Art] The ink jet recording method has many advantages, such as non-noise, high-speed printing, fine printing, and color printing, and high definition and high resolution are called for about the printing object to a recorded material especially paper, textile materials, a textile, etc. Especially in the color picture approach, also to a regular paper, that engine performance is required, generally the diameter of a nozzle of a recording device is made quite small with about several 10 micrometers, and, for this reason, high definition and high resolution-ization are in drawing.
[0003] The important thing in the color picture formation approach is color repeatability, and since it is necessary to print using three colors of yellow, a Magenta, and cyanogen at least, it serves as requirements with the most important balance of the hue of the color of each color, and the depth of shade of each color. For this reason, about the hue of a color, it inquired quite in more detail than before, and the color with clear color etc. has been sorted out. However, although it is necessary to perform balance adjustment of the depth of shade of each color further in order to acquire more minute color repeatability, the actual condition is that the research on the balance of the depth of shade of each color is hardly reported for the moment.
[0004]
[Problem(s) to be Solved by the Invention] This invention aims at offering the high definition and the color picture formation approach of high resolution of having excelled in color repeatability further in the approach of forming a color picture in a recorded material by the ink jet recording method using three colors of yellow, a Magenta, and cyanogen at least by adjusting the balance of the hue of the color of each color, and the depth of shade of each color.
[0005]
[Means for Solving the Problem] This invention is the color picture formation approach characterized by being adjusted and the aquosity record ink composed from yellow, the Magenta, and the color of cyanogen each hue becoming so that the following conditions may be fulfilled in the approach of forming a color picture in a recorded material by the ink jet recording method using three colors of yellow, a Magenta, and cyanogen at least.
Yellow: (it is the same the value measured by the 0.5 g/L;pH7 phosphoric-acid buffer, and the following) The depth-of-shade value (Avis) calculated by the Garland type should be in the range of 20 to 85.
Magenta: The depth-of-shade value calculated by the Garland type (Avis) Be in the range of 35 to 115.
Cyanine: The depth-of-shade value calculated by the Garland type (Avis) Be in the range of 40 to 115.
[0006] The description of this invention is said depth-of-shade value of the aquosity record ink of each hue (Avis), in case a color picture is formed using yellow, a Magenta, and the aquosity record ink of three colors of cyanogen at least. By adjusting so that it may go into said predetermined range, it is offering high definition and the color picture formation approach of high resolution excellent in color repeatability. That is, it is the depth-of-shade value of yellow, a Magenta, and the aquosity record ink of each hue of three colors of cyanogen (Avis) at least. If only it adjusts so that it may go into the predetermined range, it finds out that a color picture with always sufficient color repeatability is obtained easily.
[0007] It sets to this invention and is said depth-of-shade value (Avis). It is measured by the following approach. The aquosity record ink to measure is measured to 200ml measuring flask at 1.0g accuracy, and is prepared to 200ml using ion exchange water. This liquid and 5ml are taken to 50ml measuring flask, and it prepares to 50ml using PH7

phosphoric-acid buffer.
[0008] Here, PH7 phosphoric-acid buffer prepares 19.5ml of sodium-dihydrogenphosphate 2 0.2-mol hydrates (phosphoric-acid 1 hydrogen sodium 30.5ml and 0.2 mols) to 100ml with ion exchange water, and is obtained.
[0009] The absorbance of each wavelength is measured for the prepared liquid using spectrophotometer UV-265FN (Shimadzu). The wavelength which measures an absorbance measures every 10nm a total of 31 waves for the absorbance from 400nm to 700nm. It is computed by the following formula (I) from 31 waves of this measured absorbance.
[0010]
[Formula 1]

$$Avis = X' + Y' + Z' \quad \text{---------- (I)}$$

ただし、

$$X' = \sum_{400}^{700} F\lambda S\lambda \bar{x}\lambda \Delta\lambda \quad \text{---------- (1)}$$

$$Y' = \sum_{400}^{700} F\lambda S\lambda \bar{y}\lambda \Delta\lambda \quad \text{---------- (2)}$$

$$Z' = \sum_{400}^{700} F\lambda S\lambda \bar{z}\lambda \Delta\lambda \quad \text{---------- (3)}$$

ここで、

$\bar{x}$、$\bar{y}$、$\bar{z}$；ＣＩＥの等色関数

$S\lambda$　；標準の光の分光分布

$F\lambda$　；波長λにおける吸光度

なお、$S\lambda \cdot \bar{x}\lambda$、$S\lambda \cdot \bar{y}\lambda$及び$S\lambda \cdot \bar{z}\lambda$を重価関数といい、

[0011] This is JIS Z 8719-1984. The "assessment approach of chromaticities, such as conditions of the object color," (JIS handbook color-April 12, 1986 Japanese Standards Association issuance) appended chart The 10-degree visual field and the **** function fx of a standard illuminant D65 which are indicated by 3-1, fy, and fz It used.
[0012] said depth-of-shade value in this invention (Avis) Integral absorption value (imtegrated absorptivity) **** -- saying, the determinant is the class of color in aquosity record ink, its concentration, etc. Therefore, it sets to this invention and is a depth-of-shade value (Avis). As the adjustment approach, it is carried out, for example by the following approach.
[0013] Namely, depth-of-shade value (Avis) If fewer than desired value, a color will be changed, or a part for a required color will be added, it will filter again, and ink will be prepared. Moreover, depth-of-shade value (Avis) If larger than desired value, a color is changed, or the water-soluble organic solvents or water other than a color will be added, color concentration will be lowered, it will filter again, and ink will be prepared. The aquosity record ink used for this invention is effectively used, when one sort of colors are included, or also when using the aquosity record ink of each hue which mixed two or more sorts of colors.
[0014] Although especially the preparation approach of the ink for record of this invention is not restricted, one or more sorts of water soluble dye, one or more sorts of water-soluble organic solvents and water (usually ion exchange water), and a still more nearly required additive are mixed and filtered, or these water soluble dye is mixed with a water-soluble organic solvent, it once filters, an insoluble object is removed, water is added to this, and the ink for record is easily prepared by filtering further as occasion demands.
[0015] The obtained aquosity record ink is a depth-of-shade value (Avis) by the above mentioned approach. It measures and adjusts within limits specified to this invention.
[0016] As water soluble dye, direct dye, acid dye, or reactive dye is mentioned here. The solubility to water and a water-soluble organic solvent is high especially, and the color which raises the water resisting property of the

recorded image and lightfastness is desirable. Specifically For example, the C.I. direct blues 86 and 199, the C.I. direct red 9 and 227, the C.I. direct yellow 86, 142, and 144, the C.I. acid yellow 23, 42, and 49, C.I. acid red 14, 34, 35, 37, 52, and 249, C. The I. acid blues 7, 9, and 249, the C.I. reactive red 24, 35, 111, 114, 174, 180, and 184, C.I. reactive yellow 13, 14, 15, 16, 17, 23, 24, 37, 42, 75, 76, 77, 79, 114, and 115, 116, the C.I. reactive red 21, 22, 23, 34, 35, 36, 49, 50, 63, 64, 106, 108, 109, 110, 111, 112, 113, 114, and 129, the reactive blues 19, 20, 21, 27, 28, 37, 38, 77, and 100, 101, 123, 147, and 148 grades are mentioned. these colors are independent -- or it is mixed and used.
[0017] The water soluble dye used for this invention especially has especially the desirable thing for which the color which has the maximum absorption wavelength (it is the same the value measured by the pH7 phosphoric-acid buffer and the following) of the visible region of yellow, a Magenta, and the aquosity record ink of each hue of cyanogen in the following range is used.
yellow: -- 350nm - 450nm Magenta: -- 500nm - 600nm cyanine: -- 600nm - 680nm [0018] The addition of these water soluble dye is the depth-of-shade value of the ink for aquosity record (Avis). Although determined in balance, it is usually used one to 10% of the weight among aquosity record ink. The depth-of-shade value specified especially to this invention (Avis) In order to adjust to the predetermined range, it is desirable to mix and use two or more sorts of colors. In addition, in this invention, weight % of water soluble dye says the value converted into color purity.
[0019] The water-soluble following organic solvents are mentioned as a water-soluble organic solvent used suitable for this invention. For example, a methanol, ethanol, isopropanol, n-propanol, n-butanol, a sec-butanol, a tert-butanol, isobutanol, Amides, such as alcohols, such as benzyl alcohol, dimethylformamide, and a diethyl formamide Ketones, such as an acetone and diacetone alcohol, a tetrahydrofuran, Lactams, such as ether, such as dioxane, and a caprolactam, ethylene glycol, Propylene glycol, a butylene glycol, pentanediol, a diethylene glycol, Triethylene glycol, tetraethylene glycol, thiodiglycol, Thiodiethylene glycol, hexylene glycol, 1, 2-butanediol, 1,4-butanediol, 1,5-pentanediol, the 2-methyl -2, 4-pentanediol, Polyhydric alcohol, such as a glycerol, 1 and 2, and 6-hexane triol A polyethylene glycol, (average-molecular-weight 200,300,400,600 grade), Polyalkylene glycols, such as a polypropylene glycol (average-molecular-weight 400,700 grade) Ethylene glycol monoethyl ether, ethylene glycol monobutyl ether, Ethylene glycol monophenyl ether, the diethylene-glycol monomethyl ether, diethylene glycol monoethyl ether, the diethylene-glycol monobutyl ether, [0020] The triethylene glycol monomethyl ether, the triethylene glycol monoethyl ether, The triethylene glycol monobutyl ether, propylene glycol monomethyl ether, The propylene glycol monoethyl ether, the propylene glycol monobutyl ether, The propylene glycol monopropyl ether, the propylene glycol monophenyl ether, The dipropylene glycol monobutyl ether, the triethylene glycol monomethyl ether, The low-grade alkyl ether of polyhydric alcohol, such as the triethylene glycol monoethyl ether An acetylene glycol derivative (trade name: SAFI Norian : Nissin Chemical make), Alkanolamines, such as monoethanolamine, diethanolamine, and triethanolamine Nitrogen-containing heterocycle type ketones, such as 1,3-dimethyl-2-imidazolidinone 2-pyrrolidone, a N-methyl-2-pyrrolidone, an N-ethyl-2-pyrrolidone, An N-vinyl-pyrrolidone, an N-octyl-2-pyrrolidone, an N-(2-hydroxyethyl)-2-pyrrolidone, An N-cyclohexyl-2-pyrrolidone, an N-dodecyl-2-pyrrolidone, An N-isopropyl-2-pyrrolidone, an N-(n-butyl)-2-pyrrolidone, An N-(t-butyl)-2-pyrrolidone, an N-hexyl-2-pyrrolidone, Pyrrolidones, such as an N-(3-hydroxypropyl)-2-pyrrolidone, an N-(2-methoxy ethyl)-2-pyrrolidone, an N-(3-methoxy propyl)-2-pyrrolidone, an N-benzyl-2-pyrrolidone, and a polyvinyl pyrrolidone, are mentioned. These water-soluble organic solvents are independent, or are mixed and used.
[0021] By the above, the remainder consists [a water-soluble organic solvent] of water five to 30% of the weight preferably zero to 40% of the weight one to 20% of the weight in the aquosity record ink of this invention 0.5 - 30 % of the weight of water soluble dye.
[0022] In order to make the aquosity record ink of this invention possess a much more good property, the various additives used conventionally are used together by it if needed. concrete -- for example, a penetrating agent, antiseptics, and antifungal agents (for example, sodium dehydroacetate, 4-chloro-3-methyl phenol, etc.) -- in addition to this, the surfactant of an ultraviolet ray absorbent, a viscosity controlling agent, an anion system, or the Nonion system, a urea, an electrical conductivity regulator, a buffer for pH, pH regulator, a resistivity regulator, an infrared absorption agent, an antioxidant, a chelating agent, a defoaming agent, a surface tension regulator, etc. are mentioned.

[0023]
[Effect of the Invention] According to this invention, the good aquosity record ink of the balance of the hue of yellow, a Magenta, and the color of each color of cyanogen and the depth of shade of each color can be prepared easily, and the high definition and the color picture formation approach of high resolution of having excelled in color repeatability in this way can be acquired easily.
[0024]

[Example] Hereafter, although an example and the example of a comparison explain this invention to a detail, this invention is not limited to examples, such as this. % means weight % among an example.
[0025] The yellow and Magenta which are shown below in preparation of aquosity record ink, and the class product of cyanogen are often mixed, deaeration processing is carried out after pressure filtration using a vacuum pump with the membrane filter of 0.45 micrometers of apertures, aquosity record ink is prepared, and it is a depth-of-shade value (Avis) by the need. lambdamax of the aquosity record ink adjusted and obtained so that it might become the predetermined range And depth-of-shade value (Avis) It is shown in each tail.
[0026]
Yellow (1)
C. I.Direct Yellow 144 1.5% polyethylene glycol (#200) 10.0% Propylene glycol propyl ether 4.5% urea 1.0% SAFI Norian 465 0.5% (acetylene glycol derivative; it is the same the Nissin Chemical make and the following)
Ion exchange water 82.5% [0027] lambdamax of this aquosity record ink And depth-of-shade value (Avis) It is as follows.
lambdamax=408**5nm depth-of-shade value (Avis) = 27 [0028]
Yellow (2)
C. I.Acid Yellow 23 2.0% diethylene glycol 8.0% Glycerol 8.0% ASECHIRE Norian EH 0.2% (acetylene glycol derivative: it is the same the Kawaken Fine Chemicals Co., Ltd. make and the following)
Ion exchange water 81.8% [0029] lambdamax of this aquosity record ink And depth-of-shade value (Avis) It is as follows.
lambdamax=425**5nm depth-of-shade value (Avis) = 74 [0030]
Yellow (3)
C. I.Acid Yellow 23 0.6%C.I.Direct Yellow 144 0.8% dipropylene glycol 7.0% Triethylene glycol monobutyl ether 5.0% ion exchange water 86.6% [0031] lambdamax of this aquosity record ink And depth-of-shade value (Avis) It is as follows.
lambdamax=415**5nm depth-of-shade value (Avis) = 29 [0032]
Magenta (1)
C. I.Acid Red 249 2.5% polyethylene glycol (#200) 13.0% Propylene glycol propyl ether 4.5% urea 2.0% SAFI Norian 465 0.5% ion exchange water 77.5% [0033] lambdamax of this aquosity record ink And depth-of-shade value (Avis) It is as follows.
lambdamax=524**5nm depth-of-shade value (Avis) = 66 [0034]
Magenta (2)
C. I.Acid Red 52 1.3%C.I.Acid Red 35 2.5% diethylene glycol 8.0% Glycerol 8.0% ASECHIRE Norian EH 0.2% ion exchange water 80.0% [0035] lambdamax of this aquosity record ink And depth-of-shade value (Avis) It is as follows.
lambdamax=550**10nm depth-of-shade value (Avis) = 108 [0036]
Magenta (3)
C. I.Acid Red 52 1.0% dipropylene glycol 9.0% Triethylene glycol monobutyl ether 5.0% ion exchange water 85.0% [0037] lambdamax of this aquosity record ink And depth-of-shade value (Avis) It is as follows.
lambdamax=565**5nm depth-of-shade value (Avis) = 47 [0038]
Cyanogen (1)
C. I.Direct Blue 199 3.8% polyethylene glycol (#200) 12.0% Propylene glycol propyl ether 4.5% urea 1.0% SAFI Norian 465 0.5% ion exchange water 78.2% [0039] lambdamax of this aquosity record ink And depth-of-shade value (Avis) It is as follows.
lambdamax=597**5nm depth-of-shade value (Avis) = 50 [0040]
Cyanogen (2)
C. I.Acid Blue 9 6.0% Diethylene glycol 8.0% glycerol 8.0% ASECHIRE Norian EH 0.2% ion exchange water 77.8% [0041] lambdamax of this aquosity record ink And depth-of-shade value (Avis) It is as follows.
lambdamax=630**5nmm depth-of-shade value (Avis) = 95 [0042]
Cyanogen (3)
C. I.Direct Blue 199 4.0% Dipropylene glycol 9.0% triethylene glycol monobutyl ether 5.0% ion exchange water 82.0% [0043] lambdamax of this aquosity record ink And depth-of-shade value (Avis) It is as follows.
lambdamax=597**5nmm depth-of-shade value (Avis) = 54 [0044] In addition, the aquosity record ink besides the object of this invention was prepared like the above for the comparison.
[0045]

Comparison yellow (1)
C. I.Direct Yellow 144 3.5% polyethylene glycol (#200) 10.0% Propylene glycol propyl ether 4.5% urea 1.0% SAFI Norian 465 0.5% ion exchange water 80.5% [0046] lambdamax of this aquosity record ink And depth-of-shade value (Avis) It is as follows.
lambdamax=408**10nm depth-of-shade value (Avis) = 110 [0047]
Comparison Magenta (1)
C. I.Acid Red 52 0.8% Diethylene glycol 8.0% glycerol 8.0% ASECHIRE Norian EH 0.1% ion exchange water 83.1% [0048] lambdamax of this aquosity record ink And depth-of-shade value (Avis) It is as follows.
lambdamax=565**5nmm depth-of-shade value (Avis) = 14 [0049]
Comparison cyanogen (1)
C. I.Direct Blue 199 2.5% polyethylene glycol (#200) 12.0% Propylene glycol propyl ether 4.5% urea 1.0% SAFI Norian 465 0.5% ion exchange water 79.5% [0050] lambdamax of this aquosity record ink And depth-of-shade value (Avis) It is as follows.
lambdamax=597**10nm depth-of-shade value (Avis) = 27 [0051] The aquosity record ink of the assessment trial printing method above of aquosity record ink and comparison aquosity record ink are used, and he is NOVA. JET Full color image printing was performed to two kinds of test papers (regular paper) as follows, respectively, and II (ENCAD product: Bubble Jet) and MJ-700V2C (Epson product: piezo method) estimated the following item about each.
[0052] Test paper **4024DP paper (Xerox Corp. make)
** NBS paper (Japanese business supply company make)
[0053] Color balance O ... As for all the balance of the depth of shade of each color, the image with good and minute sufficient repeatability was obtained.
** ... A defect has a part of balance of the depth of shade of each color, and repeatability with a sufficient image was not acquired.
x ... The balance of the depth of shade of each color is poor, and did not have repeatability.
[0054] Using example 1 yellow (1), a Magenta (1), and the aquosity record ink of the combination of cyanogen (1), it printed to each above-mentioned test paper with each above-mentioned printing method, and color balance was evaluated. A result is shown in table 1-.
[0055] Using example 2 yellow (2), a Magenta (2), and the aquosity record ink of the combination of cyanogen (2), it printed to each above-mentioned test paper with each above-mentioned printing method, and color balance was evaluated. A result is shown in a table 1.
[0056] Using example 3 yellow (3), a Magenta (3), and the aquosity record ink of the combination of cyanogen (3), it printed to each above-mentioned test paper with each above-mentioned printing method, and color balance was evaluated. A result is shown in a table 1.
[0057] Using example 4 yellow (1), a Magenta (3), and the aquosity record ink of the combination of cyanogen (3), it printed to each above-mentioned test paper with each above-mentioned printing method, and color balance was evaluated. A result is shown in a table 1.
[0058] Using example of comparison 1 comparison yellow (1), a comparison Magenta (1), and the aquosity record ink of the combination of cyanogen (2), it printed to each above-mentioned test paper with each above-mentioned printing method, and color balance was evaluated. A result is shown in a table 1.
[0059] Using example of comparison 2 yellow (2), a comparison Magenta (1), and the aquosity record ink of the combination of cyanogen (2), it printed to each above-mentioned test paper with each above-mentioned printing method, and color balance was evaluated. A result is shown in a table 1.
[0060] Using the aquosity record ink of the combination of example of comparison 3 yellow (1), a Magenta (1), and comparison cyanogen (1), it printed to each above-mentioned test paper with each above-mentioned printing method, and color balance was evaluated. A result is shown in a table 1.
[0061] Using the aquosity record ink of the combination of example of comparison 4 comparison yellow (1), a Magenta (1), and comparison cyanogen (1), it printed to each above-mentioned test paper with each above-mentioned printing method, and color balance was evaluated. A result is shown in a table 1.
[0062] Using the aquosity record ink of the combination of example of comparison 5 comparison yellow (1), a comparison Magenta (1), and comparison cyanogen (1), it printed to each above-mentioned test paper with each above-mentioned printing method, and color balance was evaluated. A result is shown in a table 1.
[0063]
[Table -1]

	印字方式			
	NOVAJETII		MJ－700V2C	
	4024DP紙	NBS紙	4024DP紙	NBS紙
実施例1	○	○	○	○
実施例2	○	○	○	○
実施例3	○	○	○	○
実施例4	○	○	○	○
比較例1	△	△	△	△
比較例2	△	△	△	△
比較例3	△	△	△	△
比較例4	×	×	×	×
比較例5	×	×	×	×

[Translation done.]